SECTION I. NOTICE INVITING PROPOSALS

The City of Sunnyvale is seeking proposals from qualified contractors to provide a comprehensive Traffic Signal Preventive Maintenance and Repair Program for a one-year period with an option to extend the contract up to four (4) additional one-year periods.

SECTION II. INSTRUCTIONS TO PROPOSERS

A. **Preparation of Proposals** – Proposals shall be made on the Proposal Form included in this Request for Proposals. Proposers shall enter all requested information in the appropriate spaces on the Proposal Form. No oral, telephone, facsimile or electronic proposals will be accepted. All costs of proposal preparation shall be borne by the proposer.

B. **Examination of Proposal Documents** - The Proposal Documents consist of this Request for Proposals, each and every document listed in the Table of Contents of the request, and any addenda which may have been issued. Proposers shall thoroughly examine and be familiar with all Proposal Documents. Submission of a proposal shall constitute proposer's acknowledgment upon which the City may rely that the proposer has thoroughly examined and is familiar with the Proposal Documents. Failure or neglect of a proposer to receive or examine all or part of the Proposal Documents shall in no way relieve the proposer from any obligations with respect to this Request for Proposals or any resultant Contract. No claim for additional compensation will be allowed which is based upon a lack of knowledge of any part of the Proposal Documents.

C. **Conformance to Proposal Requirements** - Proposals shall conform to the requirements of this Request for Proposals. All requested attachments shall be submitted with the completed Proposal Form and in the designated format. Failure to comply with all requirements may result in proposal rejection.

D. **Interpretation of Proposal Documents and Addenda** - Should a proposer discover conflicts or ambiguity in the Proposal Documents that require a decision or explanation, the proposer may request an interpretation. Such a request shall be made in writing and delivered to the person identified on the cover page of this Request for Proposals no later than five (5) calendar days before the deadline for receipt of proposals. Every interpretation made to proposers will be in the form of an Addendum issued by the City. Addenda, if issued, will be sent as promptly as possible to all parties that have been issued Proposal Documents. Only properly issued Addenda shall be binding upon City; any oral and/or other form of interpretation or clarification will have no legal or contractual effect. Proposers shall acknowledge the receipt of Addenda on the Proposal Form.

E. **Submission of Proposals** - Proposers shall submit original (clearly marked 'Original') and four (4) copies (clearly marked 'Copy') of the completed Proposal Form, together with any required attachments or explanatory materials, prior to the time and date set for receiving proposals as stated on the cover page of this Request for Proposals or any modifying Addenda. Proposals shall be delivered in a sealed envelope ***clearly marked with the applicable proposal number*** addressed to:

City of Sunnyvale
Purchasing Division
City Hall Annex
650 West Olive Avenue
PO Box 3707
Sunnyvale, CA 94088-3707

F. **Modification or Withdrawal of Proposals**

1. Before Date and Time for Receipt of Proposals - Proposals that contain mistakes discovered by a proposer before the date and time for receipt of proposals may be modified or withdrawn by written notice to City's Purchasing Officer received prior to the deadline. Any modification shall be clearly identified as such and shall be made in writing, executed and submitted in the same form and manner as the original proposal..

2. After Date and Time for Receipt of Proposals - A proposer may not modify its bid after the date and time set for receipt of proposals. A proposer alleging a mistake in a proposal may be permitted to withdraw its proposal if the proposer alleges that a mistake was made in its proposal that made the price materially different than intended, provided that bidder gives written notice of the mistake and the manner in which it occurred to City's Purchasing Officer within five (5) calendar days following the deadline for receipt of proposals and City's Purchasing Officer deems it to be in the best interest of the City.

G. **Late Proposals** - Proposers shall be responsible for the timely delivery of proposals. Proposals received after the deadline for receipt of proposals shall not be accepted and shall be returned to the proposer unopened unless necessary for identification purposes.

H. **Public Opening of Proposals** - Each proposal irrespective of any defects or irregularities, that has been received prior to the deadline for receipt of proposals, except those that have been properly withdrawn, will be publicly opened by a representative of the Purchasing Division at the date and time announced for such opening. If one or more members of the public are present, the name and address of each proposer will be read aloud at or shortly following the deadline for receipt of proposals. Further information will be made public after contract award.

I. **Proposals to Remain Open** - The proposer shall guarantee its proposal for a period of sixty (60) calendar days from the date of proposal opening.

J. **Non-Collusion Certification** - By submitting a proposal, proposer is certifying that it has not directly or indirectly been collusive with any other proposers in the preparation and submission of the proposal. If at any time it shall be found that the proposal to whom a contract has been awarded has, in presenting the bid, colluded with any other party or parties, said proposer shall be liable to the City for all loss or damage which the City has or may suffer as the result of the collusive activity, including, but not limited to, the cost of advertising and awarding a new contract.

K. **Evaluation Criteria** - Proposals will be evaluated based on the following criteria:

Criteria	Percentage
1. Qualifications and ability to meet the performance requirements. Appropriateness and qualifications of the personnel, experience, training, certifications, equipment, and facilities for the specified services. Ability to perform the services described in the Detailed Specifications (Attachment A) in the required manner and time frame.	35%
2. Computerized traffic signal maintenance program and inventory management system for City of Sunnyvale. Appropriateness and ability to implement the required computerized maintenance and inventory system as specified in the Detailed Specifications (Attachment A).	15%
3. Costs. Based on proposal pricing indicated on the attached Proposal Form. The payment of prevailing wage is neither required nor precluded. However, proposer shall include with the Proposal Form proposer wage and benefit structure for proposers employees who will perform work under this contract (question #11).	40%
4. References. Comments from references regarding proposer's responsiveness to customer requirements, compliance with the contract term and conditions, and work quality.	10%

L. **Sunnyvale Business License** – The successful proposer must either possess a current, valid Sunnyvale business license or must have submitted a Sunnyvale business license application and fee at the time of award.

M. **Contract Award** - Contract award will be made to the proposer whose proposal offers the best value to the City of Sunnyvale. The acceptance of a proposal will be evidenced by a written contract delivered to the successful proposer for execution.

N. **Contract Documents** - Contract documents will consist of this Request for Proposals; its attachment(s) and addenda, if any; the successful proposer's completed and signed Proposal Form; the successful proposer's proof of insurance coverage; and an executed Service Agreement (Attachment G).

O. **Reservations** - The City reserves the right to:

1. Postpone the date and time announced for receipt of proposals by issuance of an Addendum at any time prior to the deadline for receipt of proposals;
2. Reject any proposal that is conditional in any way or that contains erasures, items not called for, items not in conformity with applicable law, changes, additions, alternate proposals, or any other modifications of the Proposal Form which are not in accordance with the Proposal Documents;
3. Make any investigations deemed necessary to determine proposer's ability to satisfactorily meet City requirements;
4. In the event that only one proposal is received in response to this Request for Proposals, require the sole proposer to submit cost or pricing data to assist in determining if the price is reasonable;
5. Reject any or all proposals;
6. Waive minor defects or irregularities in any proposal, provided that the discrepancy does not affect the proposal amount or give the proposer an advantage over others;

SECTION III. SPECIFICATIONS

A. **Background** - The City of Sunnyvale's Traffic Signal Preventive Maintenance and Repair Program involves ongoing and regular field preventive maintenance and repair of traffic signals and other related equipment by a licensed contractor with properly trained, experienced and qualified personnel. The City of Sunnyvale currently operates and maintains 129 traffic signals, 1 in-pavement crosswalk light and 3 flashing beacon installations, which are listed in Attachment B.

The City requires monthly preventive maintenance on all traffic signals and flashing beacons listed in Attachment B. In addition, the City requires an annual preventive maintenance check and an annual inventory of all components of each traffic signal.

The contract which may result from this Request for Proposals will include, but not be limited to, the following provisions:

- Regular monthly preventive maintenance services and cleaning and inspection of traffic signals on an ongoing basis.
- Regular monthly daylight inspection of all traffic signals and in-pavement crosswalk lights.
- Semi-annual night inspection of all traffic signals and in-pavement crosswalk lights.
- Annual preventive maintenance of all traffic signals, in-pavement crosswalk lights, and flashing beacons.
- Repair or replacement of traffic signal control devices, as requested.
- Warranty service and management of warranty claims for any and all traffic signal equipment used by the City.
- Advance notification to City staff for any and all planned work.
- Regular submission to the City of accurately maintained and detailed inventory records of traffic signal equipment.
- Regular submission to the City of accurate monthly activity records and reports of any and all work and service calls related to the City's traffic signals.
- Response to all service requests in a timely manner.
- An assessment of liquidated damages for failure to provide a timely response to service requests.
- Professional and diligent performance of all contract requirements.

B. **Detailed Project Specifications** – See Attachment "A" for detailed City of Sunnyvale project specifications.

C. **Contract Term** – The contract shall commence May 1, 2005, or on the contract execution date, whichever is later, and will continue through April 30, 2006. Beginning 2006, the City will have the option of extending the contract up to four (4) additional one-year period, each commencing on May 1 and continuing until midnight, April 30, provided that the City provides an annual written notice of intent to extend the contract. Under no circumstances shall the term of the contract continue beyond midnight, April 30, 2010.

After the initial contract term, the City may terminate the contract at any time by providing thirty (30) days' written notice to the successful proposer.

The successful proposer may give written notice to the City prior to February 1, 2005, or prior to February 1 of any subsequent year, that it does not consent to extending the contract beyond March 31. In the event that the City receives such timely notice from the successful proposer, the contract will expire at midnight, March 31.

D. **Proposer Qualifications** – Proposers shall be possess a valid California State Contractor's License, either Class "A" or Class "C-10" throughout with contract term, including extensions, if any, and shall be experienced performing similar services of similar scope for other public agencies.

E. **Compensation** – Rates may be reviewed annually by the successful proposer and the City; and rate increases may be requested in writing with detailed justification. Nevertheless, the maximum increase in labor and/or equipment costs in any calendar year shall be five percent (5%) or the most recent preceding increase in the Consumer Price Index (CPI) for the West Coast published by the United States Department of Labor, Bureau of Labor Statistics, which ever is less.

F. **Performance Incentive Goal** – A Performance Incentive Goal will be set for the successful proposer, based on t performance measures. If the successful proposer responds to 90% or more of all emergency signal calls within one hour, and completes 90% or more of all emergency repairs within one day, the successful proposer shall receive an annual Performance Incentive of Fifteen Thousand and no/100 dollars ($15,000). The City shall conduct periodic review of all emergency signal call response times and emergency repair times throughout the year. If the successful proposer meets or exceeds the goals throughout the entire year, the City shall authorize payment of the Performance Incentive in the December payment. This Performance Incentive shall be available to the successful proposer each year that the contract is in effect, if he/she meets the Performance Incentive Goals. If the successful proposer does not meet the Performance Incentive Goals as specified, the Incentive shall be forfeited that year.

SECTION IV. TERMS AND CONDITIONS

A. **Service Agreement** - The terms and conditions which apply to this purchase shall be those set forth in the attached sample Service Agreement (Attachment G), including the City's insurance requirements for the successful proposer.

B. **Proposer's Wage and Benefit Structure** – Proposer warrants that if the wage and benefits structure described in Section 11 of the Proposal Form changes, the proposer shall provide written notice of each change to the City at least thirty (30) days before its effective date.

SECTION V. INSTRUCTIONS FOR COMPLETION OF PROPOSAL FORM

A. **Entries on Proposal Form** - All entries shall be printed in ink or shall be typewritten.

B. **Corrections** - Corrections shall be initialed in ink by the person signing the proposal.

C. **Project Pricing** - Proposal pricing shall be complete, including all costs for labor, supervision, methods or processes, implements, tools, machinery, equipment, transportation and materials required to complete the work described in this Request for Proposals.

D. **Required Information** - All information requested for entry on the Proposal Form must be provided. If necessary, proposers may attach additional sheets clearly cross referenced to the applicable item number. In addition, proposer shall attach and submit the detailed narratives described in Item 11 of the Proposal Form.

E. **Addenda** – Proposers shall indicate the number and date of all addenda received.

F. **Signature** - Proposals shall be signed by an authorized representative of proposer.

DETAILED SPECIFICATIONS

ATTACHMENT A

III. SCOPE OF WORK

A. SERVICES

The Contractor shall provide ongoing and regular field preventive maintenance and repair of traffic signal equipment, flashing beacons, and other related equipment by duly trained and qualified personnel.

The Contractor is required to have on staff and available to perform Services under this contract, designated for the City of Sunnyvale a Traffic Signal Technician with a minimum of four years' of experience in traffic signal repairs. The Traffic Signal Technician shall have experience with the operation and maintenance of type 170, 2070, VECTOR, and various NEMA controllers currently in use by the City of Sunnyvale. The Traffic Signal Technician shall also be familiar with all software in use by the City of Sunnyvale, including but not limited to Bitrans 233, Bitrans 200SA, Bitrans 210FM, Caltrans C7 and C8, SCATS Adaptive, RHODES Adaptive, and Naztec Apogee. The Traffic Signal Technician shall also have knowledge of the operation and maintenance of inductive traffic loops, video detection systems, EMTRAC emergency vehicle preemption devices, Microwave interconnect, twisted pair interconnect, wireless 2.4GHz Spread Spectrum Radio communications, and fiberoptic cables. The Traffic Signal Technician shall keep up to date on the operation and maintenance of all state-of-the-art traffic signal control device and related equipment to ensure that the City's needs will also be supported in the future. The Traffic Signal Technician shall also be familiar with and adhere to all Caltrans and City programming standards for both traffic signal and coordination timing of traffic signal controllers.

The Contractor is required to have on staff and available to perform services under this contract a Traffic Signal Analyst with a minimum of ten years' of experience in traffic signal timing and coordination operations. The Traffic Signal Analyst, as directed by the City, shall focus on maximizing the overall efficiency of traffic signal timing and coordination operations in the City of Sunnyvale. The Traffic Signal Analyst shall be familiar with the BiTrans 233 software for type 170 controllers, BiTrans QuicTrac and QuicNet software, McCain VECTOR controller software for VTA Light Rail, SCATS adaptive traffic signal control software, RHODES adaptive traffic signal control software, time of day coordination, traffic responsive coordination, and the various communications mediums used for traffic signal interconnection. The Traffic Signal Analyst shall also be knowledgeable about the operation of all traffic signal equipment currently in use by the City of Sunnyvale. The Traffic Signal Analyst shall maintain a good working knowledge on the operation of any state-of-the-art traffic signal control device or related equipment to ensure that the City's needs will also be supported in the future. The Traffic Signal Analyst shall also be familiar with and adhere to all Caltrans and City programming standards for both traffic signals and coordination timing of traffic signal controllers.

The Contractor shall provide and maintain emergency service response of the City's traffic signals on a 24-hour a day, 7 days per week basis, including all holidays.

The Contractor shall provide a vehicle for the use of the Contractor's Traffic Signal Technician which shall be equipped with a permanently mounted arrow board; warning beacon/strobe lights; traffic cones; construction warning signs; a hydraulic bucket capable of reaching a height of 40 feet from the roadway surface; proper lighting for illuminating the workarea at night; necessary computer laptop for programming, maintenance and testing of traffic signal controllers and various equipment; and communications equipment for dispatch. In addition, Contractor's employee shall be required to have radio communication equipment for dispatch purposes. At a minimum, this shall be a cellular phone capable of numeric and text messages with vibration alert. All of the required equipment shall be properly maintained and functional 24 hours a day, 7 days a week, including holidays.

The Contractor ensure that any vehicle used within the boundaries of the City of Sunnyvale where lane closures or work within the travel lanes is required shall be equipped with an arrow board, warning beacons/strobe lights, the proper quantity and sized cones for a lane closure, and advance warning signs. All of the Contractor's employees working within the boundaries of the City shall be equipped with a communications device capable of instant 2-way communications for extended periods of time with the Contractor's shop or with City staff.

The Contractor shall have available, and readily accessible in functioning order, all required tools, equipment, apparatus, facilities, and materials needed to perform all work necessary to maintain and repair the traffic signals and flashing beacons listed in Attachment B in compliance with current Caltrans and City standards and specifications.

The Contractor shall furnish temporary replacement traffic signal controllers, coordination units, preemption units, traffic signal communications and monitoring equipment, detector amplifiers, conflict monitors, video detection systems, and uninterruptable power supplies for traffic signals and various other standard traffic signal equipment. Contractor-furnished temporary spares shall be identical to the component being replaced in manufacture, make and model. The Contractor shall deviate from this requirement only upon written advance approval from the City. The Contractor shall provide the temporary equipment at no additional charge to the City whenever the original units are removed for repair or servicing.

The Contractor shall cooperate with the City in recalibrating traffic signal coordination timing and progression.

The Contractor shall change the timing of traffic signals only upon the direction or advance written approval of the City.

During emergency conditions, the Contractor shall assure full cooperation with the City of Sunnyvale Department of Public Safety, the Santa Clara County Sheriff's Department, the California Highway Patrol (CHP) and those employees of the City of Sunnyvale Department of Public Works Division of Transportation and Traffic as indicated.

The Contractor shall ensure that all staff shall performing work under this contract obtain Rail Safety certification from Valley Transportation Authority(VTA) and Caltrain allowing them to work in and around VTA and Caltrain track right of way.

The Contractor shall not represent the City of Sunnyvale in matters of policy or procedures under this contract, shall not make any reference to City policy or procedures, and shall refer all questions or inquiries from the public regarding policy and procedures, or terms and conditions of this contract to the City.

The Contractor shall provide traffic control/lane closures that conform to the WATCH manual and/or Caltrans Traffic Manual. For any work impacting bicycle lanes, the Contractor's traffic control/lane closures shall conform to the City of Sunnyvale's Standard Operating Procedure for Bicycle/Pedestrian Safety (Attachment F).

B. FAILURE TO PERFORM

Should the Contractor fail to properly execute the work in a timely or correct matter as provided under the terms of this contract, the City, after providing the Contractor with three business days' notice, may perform or hire another Contractor to perform such work and deduct the cost plus 25% thereof from any payment due to the Contractor.

The Contractor shall provide the City with a written schedule of work within three business days of approval of any repair/service estimate. If the Contractor fails to provide the written schedule, the City shall consider the Contractor to be "failing to perform" a necessary task within a timely matter. The City shall then perform or hire another Contractor to perform such work and deduct the cost plus 25% thereof from any payment due to the Contractor.

C. ROUTINE MAINTENANCE

The Contractor shall enact a continuing comprehensive maintenance program designed to eliminate or reduce any incidence of malfunctions, complaints, and extension of the useful life of the City's traffic signal equipment. The program shall include at a minimum the following:

1. MONTHLY AND ANNUAL PREVENTIVE MAINTENANCE

The Contractor shall provide monthly preventive maintenance on the signalized intersections listed in Attachment B. The Contractor shall complete a Monthly Preventive Maintenance Checklist (Attachment C) for each maintenance inspection and shall indicate the minimum work required for each item. The Contractor shall maintain one copy of the completed form for each intersection and for each inspection in the Contractor's business office throughout the term of this contract. The Contractor shall submit copies of the completed monthly preventive maintenance form as part of its monthly activity report. The April and October monthly preventive maintenance inspections shall be conducted at night and shall be considered the semi-annual night-time inspections required under this contract.

The Contractor shall provide annual preventive maintenance of the signalized intersections and flashing beacons listed in Attachment B. The Contractor shall complete an Annual Preventive Maintenance Checklist (Attachment D) for each annual maintenance inspection and shall indicate the minimum work required for each item. The Contractor shall maintain one copy of the completed form for each intersection and for each annual inspection in the Contractor's business office throughout the term of this contract. The Contractor shall submit copies of the completed annual preventive maintenance form as part of its monthly activity report when completed. The Contractor shall submit a schedule for the annual maintenance inspection at the start of the contract. The Contractor shall maintain three copies of the full field test results of the traffic signal conflict monitor, megger test of traffic loops from the pullbox, and LED degradation test results. One copy shall be left in the traffic signal controller cabinet, one copy shall be maintained at the Contractor's business office, and one copy shall be sent to the City with the completed Annual Preventive Maintenance Checklist.

It is understood and agreed that failure on the part of the Contractor to perform monthly and annual preventive maintenance as required by this contract will cause the City to suffer an unascertainable amount of damage. Therefore, the Contractor agrees to pay to the City, not as a penalty but as liquidated damages, the amount of $500 per calendar day that the intersection is overdue for monthly or annual preventative maintenance. The total amount of liquidated damages will be totaled and deducted from the monthly invoice payment.

The Contractor shall maintain two separate logs at each signalized intersection included under this contract. One log shall detail each monthly and annual preventive maintenance inspection by the Contractor. The Contractor shall complete at a minimum on this log, the inspection date, arrival time, departure time, type of inspection, any findings or repairs, and the Contractor's employee name or ID. The other log shall detail any extraordinary repairs or service calls for the intersection. This log shall detail the nature of the emergency/service call, the Contractor's findings, the repair made, Repair Order number, if applicable, arrival time at the intersection, departure time, and the Contractor's employee name or ID.

2. TRAFFIC SIGNAL CONTROL EQUIPMENT

The Contractor shall repair, replace or otherwise render in good working order any and all defective parts of all traffic signal control equipment. Whenever the Contractor replaces any defective parts on either a temporary and/or permanent basis, the Contractor shall identify the parts being replaced by manufacturer's make and model. Further, the Contractor shall only use new parts for permanent replacement. Exceptions to this requirement shall only occur on an individual basis upon advance written approval from the City.

No permanent changes of traffic signal control devices shall be done without prior written approval from the City. Whenever any traffic signal equipment is removed/replaced/modified, the Contractor shall notify the City by telephone within one hour of the change, followed by written notification to the City within three working days. Furthermore, any changes shall also be indicated on the maintenance or repair log within the traffic signal controller cabinet.

The Contractor agrees to notify, the City in advance of any planned or scheduled traffic signal turn-offs/turn-ons necessitated by the Contractor's operations. The Contractor shall make turn-offs/turn-ons of traffic signals only upon prior written approval by the City. Furthermore, a City representative shall be present at all turn-offs/turn-ons of any traffic signals.

All traffic signal control equipment (poles, in-pavement crosswalk lights, signals, conduits, conductors, camera, loops, UPS systems, and wireless communication systems) shall be maintained in accordance with the manufacturer's recommendations. The Contractor shall bear the cost for replacing any part of the traffic signal control equipment under the provisions of the maintenance program. When the traffic signal control equipment becomes obsolete or deteriorated to the point of being beyond reasonable or cost effective repair, the Contractor shall report such conditions to the City and provide satisfactory evidence that replacements are necessary. The Contractor shall prepare estimates showing the cost breakdown of materials and labor for replacement of such traffic signal control equipment and submit this information to the City.

3. NEW INSTALLATIONS OR DELETIONS

The Contractor shall maintain any new traffic signal equipment, in-pavement crosswalk lights, flashing beacons, and any other related devices, which are installed for or by the City throughout the term of the contract. These devices will be deemed to be added to the existing signalized intersection listed on Attachment B when the City notifies the Contractor of the installation thereof. These added devices, regardless of the complexity of the technology shall be maintained in the same manner and for the same flat rate as those devices already covered by the contract.

In the event notification of the addition of any device is made any day other than the first day of the month, payment for that month shall be prorated from the first day the Contractor is notified to begin maintenance. Should responsibility for the maintenance of any current or future traffic signal device cease to be the City's, the City will notify the Contractor in writing of the last date to perform maintenance. The flat rate maintenance for any such affected device shall be prorated on the basis of the number of days that device was maintained by the Contractor.

4. IN-PAVEMENT CROSSWALK LIGHTS

The Contractor shall provide preventive maintenance for all in-pavement crosswalk lights. The same service and maintenance requirements shall exist for in-pavement crosswalk lights as for traffic signals.

5. WARRANTY SERVICE

During the warranty period for any traffic signal, LED, traffic signal controller, communications/monitoring/interconnection device, loop amplifier, video camera, electronic message sign, emergency preemption device, or any traffic signal related device, the Contractor shall be responsible for making contact between the equipment manufacturer, the installing contractor and the City regarding any required service determined to be under warranty. The Contractor shall notify the City of any undue delays in response due to the manufacturer or installing contractor and provide details of each incident.

D. CONTRACTOR SHOP AND EMERGENCY SERVICE

The Contractor shall establish, within ninety days of award of contract, adequate shop and storage facilities within ten miles travel distance to the intersection of Mathilda Avenue and Olive Avenue. This facility shall house the necessary staff, traffic signal poles, signals, traffic signal controllers, traffic signal communications devices, LEDs, controller cabinets, service cabinets, uninterruptable power supplies, wiring, pullboxes, pullbox lids, and other necessary materials and vehicular equipment to perform all maintenance required and to perform temporary and permanent repair of accident damage to traffic signal equipment/devices. This facility shall also be equipped to perform twenty-one day bench test of traffic signal controller cabinets in accordance to Caltrans and City specifications. This facility shall have all test equipment necessary to test conflict monitors, load switches, flashers, detector amplifiers, controllers, LEDs, and controller cabinets. This facility shall be staffed and open for meetings/inspections at any time Monday thru Friday during normal working hours.

The Contractor shall maintain a single local telephone number during the entire term of the contract where he/she or a designated representative can be reached 24 hours a day, 365 days a year.

The Contractor shall also maintain and provide direct phone numbers, cellular phone numbers, fax numbers, and email addresses of various pertinent staff/employees with which the City can maintain regular and direct contact with regarding billing, estimating, service calls, status reports, scheduling, testing of equipment, and various other issues.

When notified of any traffic signal device malfunction, failure, loss of indication, accident damage, construction damage, or any traffic signal service call, the Contractor shall respond and be at the location within one hour following notification from the City, CHP, or County Sheriff first notifies the Contractor.

In the event of a knockdown, the Contractor shall provide temporary emergency replacement of a type acceptable to the City until permanent repairs can be accomplished. The Contractor shall not reinstall the damaged equipment even if there are no visible signs of damage. Public safety and reliability is of the utmost concern. The Contractor shall install a temporary device appropriate for the situation and consult with the City to identify a permanent replacement. Required replacement of equipment will require prior written approval from the City before such replacements are commenced in conjunction with an emergency call.

The requirement of the previous paragraph will apply except when a pedestrian pushbutton pole or 1B pole is knocked down with no damage to the existing foundation or anchor bolts. In both of these cases, the Contractor shall make a permanent repair with entirely new equipment during the initial service call.

At any time the Contractor is notified of an emergency situation by the City, CHP, or County Sheriff, or other duly recognized authority, the Contractor shall call the appropriate phone number or email the appropriate City staff including Transportation and Traffic personnel of the nature of the emergency call.

Upon completion of the emergency work, the Contractor shall notify the City by telephone and/or email that the emergency work has been completed. In addition, the Contractor shall notify the City in writing within three calendar days that such repairs have been completed.

It is understood and agreed that failure on the part of the Contractor to respond within one hour to any emergency/service call as provided will cause the City to suffer an unascertainable amount of damage. Therefore, the Contractor agrees to pay to the City, not as a penalty but as liquidated damages, the amount of $500 per hour. The time for such liquidated damages shall commence from the first hour after the required response time for emergency/service calls indicated in the previous sections. The total amount of liquidated damages will be totaled and deducted from the monthly invoice payment.

The Contractor shall enter any emergency/service call onto the Extraordinary Repair Log at the intersection controller cabinet along with the minimum required information as stated in the previous sections. Failure to do so will be construed to be a failure to respond to the emergency/service call. In this case, the Contractor agrees to pay to the City, as liquidated damages, the amount of $500 per hour. The time for such liquidated damages shall commence from the first hour after the required response time for emergency/service calls indicated in the previous sections. The total amount of liquidated damages will be totaled and deducted from the monthly invoice payment.

The City shall perform spot checks of the Contractor's response and response times to emergency/service from time to time throughout the term of the contract, through comparison of emergency/service notification time to the Contractor by the City with the arrival time noted in the intersection logs. The City may also choose to randomly time and respond to the emergency/service call along with the Contractor in order to check response times and workmanship of the Contractor.

E. SIGNAL UPGRADES, MODIFICATIONS, AND INSTALLATIONS

The Contractor shall install, modify, and/or upgrade traffic signals and all associated hardware or traffic safety devices as requested by the City. All such work shall be considered extra work and shall be performed to the satisfaction of the City.

No additional or extra work shall be commenced or undertaken by the Contractor unless authorized in advance in writing by the City. Said written authorization is a condition precedent to the Contractor's entitlement to reimbursement or remuneration for such services. Additional or extra work shall be performed in accordance with the most current version of the Caltrans Standard Plans and Caltrans Standard Specifications. This work shall be performed within a specified time limit established by the City and for a mutually agreed upon price.

The City shall retain discretionary right to perform any additional work through the use of City forces, by negotiated agreement, or to advertise such work for construction by others.

F. RECORDS

1. PREVENTIVE MAINTENANCE CHECKLIST FORMS

The Contractor shall maintain and provide all required preventive maintenance checklists as described in the previous sections. The Contractor shall provide copies of the maintenance checklists monthly to the City along with the Contractor's invoices.

2. COMPUTERIZED MAINTENANCE MANAGEMENT AND INVENTORY SYSTEM

Within ninety days of contract award, the Contractor shall demonstrate to the City a functioning and deployed comprehensive PC Windows-based, computerized traffic signal maintenance management and inventory management system. This system shall be fully functional and ready to be implemented with little or no changes. Upon demonstration of the system, the City, at its option may request revisions or changes to the system to make it acceptable for use. Upon receipt of the City's requested changes/revisions, the Contractor shall ready the system for implementation within six months of the contract award. Any changes to the system requested by the City at this point will be accomplished by the Contractor at no charge to the City. Any future upgrades of the system will be offered by the Contractor to the City at no additional charge during the term of the contract. Upon the end of the contract, the City at its option may retain possession of data in electronic and hardcopy format for future use related to the City's traffic signal maintenance management and inventory.

The City will make available to the Contractor, if needed, a Microsoft Access database with inventory of all poles and equipment in service at each signalized intersection for integration into the computerized maintenance management and inventory system. The Contractor shall bar-code and tag all equipment in order to integrate into the system.

If the Contractor does not install a functioning system by ninety days of the contract award, the Contractor agrees to pay to the City, not as a penalty but as liquidated damages, the amount of $1000 per calendar day that the computerized maintenance management and inventory system is not installed. The total amount of liquidated damages will be totaled and deducted from the monthly invoice payment until the system is implemented and functioning.

At a minimum, the traffic signal maintenance management and inventory system shall provide the following features and equipment:

a. *Intersections* - A complete database of signalized intersection and flashing beacons locations, including all monthly and annual maintenance histories, complete equipment inventory, design/construction as-built drawings in AutoCad format, electronic photo images, repair history and installation date of all equipment utilized at each location. The system should also have mapping capabilities and be compatible with the City's GIS.

b. *Assets* - Asset inventory, maintenance/repair history, and allow for planned future replacement and budgeting.

c. *Repair/Replacement Parts* - Real-time available inventoried replacement parts, current status of reordered equipment, and inventory tracking.

d. *Service/Emergency Calls* - A record of all calls, date and time stamp moment of receipt, dispatch, Contractor arrival and departure times. The system shall also have the ability to prioritize all received calls and provide estimated time of arrivals, and corrective actions. All records shall be updated realtime utilizing Palm Pilots, Pocket PCs, handheld scanners or other like products.

3. MONTHLY ACTIVITY REPORT

The Contractor shall submit to the City, at the same time as the submission of monthly invoices, a computerized report covering all Contractor's activities within the City of Sunnyvale during the previous month. This monthly activity report shall be provided in both electronic and hardcopy formats and shall be generated from a database, preferably using Microsoft Access (most recent version). Formatting shall be determined by the Contractor and the City. The Contractor shall be required to maintain a copy of the monthly activity report (either electronic or hardcopy) for a period of not less than five years. The monthly activity report shall include at a minimum:

a. Time any emergency/service calls were received by the Contractor, time at which the emergency/service call was dispatched to the technician, the arrival time of the technician at the requested location, the length of time spent repairing or diagnosing the problem, and the departure time.

b. A complete record of any and all work performed on the traffic signal equipment during the period covered by the monthly activity report, including the make, model, and serial number of any replacement or newly installed equipment at each intersection. The report shall also detail the make, model and serial number of any equipment replaced.

c. The date and time that any preventive maintenance work was performed.

d. Any and all pending repair work needed at each intersection along with Repair Order number.

G. MEETINGS

The Contractor and any of its staff shall be available to meet, when deemed necessary, with City staff at a mutually agreed upon time and place to review maintenance activities, operational and timing activities, pending work, estimates, work quality, and any items related to Contractor's work under this contract.

H. COMPENSATION

1. MONTHLY AND ANNUAL PREVENTIVE MAINTENANCE

The Contractor shall be compensated for services required under this contract at a flat rate per intersection.

Included in this flat rate shall be compensation for the preventive maintenance and/or repair of any or all equipment within the traffic signal controller cabinet or signal equipment as identified in Attachments C and D. Any replacement of traffic signal equipment found to be damaged while performing monthly or annual preventive maintenance shall be billed as material cost only.

Not included in this flat rate shall be painting of traffic signal poles, heads, cabinets, labor and material cost for the replacement of inductive loops, pedestrian pushbuttons, replacement of signs, LEDs, or repair to signal equipment when such equipment has been damaged by vehicular collisions, acts of God, or malicious damage.

2. EXTRA WORK

The City shall compensate the Contractor for extra work and repairs in accordance with agreed upon labor rates, material markups, equipment rates, and miscellaneous costs.

Extra work refers to the replacement, repair, upgrade or installation of any device utilized for traffic control or to insure the public's safety. The Contractor shall obtain City approval prior to scheduling any work to be performed under this provision. The Contractor shall provide documentation to support invoiced charges, including but not limited to, time cards and material invoices, upon request by the City.

3. PAYMENT AND INVOICES

Payments will be made within thirty days following receipt of an accurate invoice including written verification of work performed, by the City's Accounts Payable Unit. The written verification shall be submitted to the City in a format to be approved by the City. Invoices shall be submitted no more frequently than once per month.

CITY OF SUNNYVALE
List of Signalized Intersections

ATTACHMENT B

Intersection Number	Main Street	Secondary Street
7001	MATHILDA AVENUE	CALIFORNIA AVENUE
7002	MATHILDA AVENUE	5TH STREET
7003	FREMONT AVENUE	MARY AVENUE
7004	FREMONT AVENUE	HOLLENBECK AVENUE
7005	FREMONT AVENUE	WOLFE ROAD
7006	MARY AVENUE	REMINGTON DRIVE
7007	HOLLENBECK AVENUE	REMINGTON DRIVE
7008	SUNNYVALE SARATOGA ROAD	REMINGTON DRIVE
7009	BERNARDO AVENUE	HEATHERSTONE WAY
7010	FAIR OAKS AVENUE	OLD SAN FRANCISCO ROAD
7011	FAIR OAKS AVENUE	EVELYN AVENUE
7012	FAIR OAKS AVENUE	KIFER ROAD
7013	FAIR OAKS AVENUE	ARQUES AVENUE
7014	FAIR OAKS AVENUE	MAUDE AVENUE
7015	FAIR OAKS AVENUE	DUANE AVENUE
7016	FAIR OAKS AVENUE	CALIENTE DRIVE
7017	MATHILDA AVENUE	MCKINLEY AVENUE
7018	MARY AVENUE	IOWA AVENUE
7019	TASMAN DRIVE	ADOBE WELLS-BIRCHWOOD DRIVE
7020	TASMAN DRIVE	REAMWOOD AVENUE
7021	SUNNYVALE AVENUE	MCKINLEY AVENUE
7022	WASHINGTON AVENUE	PASTORIA AVENUE
7023	MATHILDA AVENUE	WASHINGTON AVENUE
7024	MARY AVENUE	CALIFORNIA AVENUE - BUENA VISTA
7025	KIFER ROAD	PRICE CLUB - COSTCO
7026	HOLLENBECK AVENUE	CASCADE DRIVE
7027	SUNNYVALE AVENUE	WASHINGTON AVENUE
7028	MARY AVENUE	EVELYN AVENUE
7029	EVELYN AVENUE	AGENA WAY
7030	EVELYN AVENUE	FRANCES AVENUE
7031	EVELYN AVENUE	SUNNYVALE AVENUE
7032	SUNNYVALE AVENUE	HENDY AVENUE
7033	EVELYN AVENUE	REED AVENUE
7034	WOLFE ROAD	KIFER ROAD

7035	MATHILDA AVENUE	CALIFORNIA AVENUE
7036	SUNNYVALE AVENUE	ARQUES AVENUE
7037	WOLFE ROAD	ARQUES AVENUE
7038	ARQUES AVENUE	COMMERCIAL STREET
7039	ARQUES AVENUE	SANTA TRINITA AVENUE
7040	SUNNYVALE AVENUE	BORREGAS AVENUE - MAUDE AVENUE
7041	MATHILDA AVENUE	MOFFETT PARK DRIVE
7042	MATHILDA AVENUE	LOCKHEED WAY
7043	MATHILDA AVENUE	JAVA DRIVE
7044	JAVA DRIVE	BORREGAS AVENUE
7045	JAVA DRIVE	CROSSMAN AVENUE
7046	WOLFE ROAD	EVELYN AVENUE
7047	MATHILDA AVENUE	MAUDE AVENUE
7048	SUNNYVALE SARATOGA ROAD	FREMONT AVENUE
7049	EVELYN AVENUE	ASTER AVENUE
7050	MARY AVENUE	THE DALLES AVENUE
7051	MARY AVENUE	HEATHERSTONE WAY
7052	MARY AVENUE	WASHINGTON AVENUE
7053	MATHILDA AVENUE	OLIVE AVENUE
7054	DUANE AVENUE	DE GUIGNE DRIVE
7055	CARIBBEAN DRIVE	MOFFETT PARK DRIVE
7056	WOLFE ROAD	OLD SAN FRANCISCO ROAD
7057	FAIR OAKS AVENUE	CALIFORNIA AVENUE
7058	WOLFE ROAD	INVERNESS WAY
7059	HOMESTEAD ROAD	MARY AVENUE
7060	HOMESTEAD ROAD	HERON DRIVE
7061	MATHILDA AVENUE	ROSS DRIVE
7062	FAIR OAKS AVENUE	WOLFE ROAD
7063	MAUDE AVENUE	MACARA AVENUE (N)
7064	HOLLENBECK AVENUE	ALBERTA AVENUE
7065	WOLFE ROAD	MARIA LANE
7066	ARQUES AVENUE	LAKESIDE DRIVE
7067	WOLFE ROAD	CENTRAL EXPRESSWAY
7068	HOMESTEAD ROAD	WRIGHT AVENUE
7069	SUNNYVALE AVENUE	OLIVE AVENUE
7070	SUNNYVALE AVENUE	IOWA AVENUE
7071	PASTORIA AVENUE	IOWA AVENUE
7072	MATHILDA AVENUE	IOWA AVENUE
7073	SUNNYVALE AVENUE	CALIFORNIA AVENUE
7074	FAIR OAKS AVENUE	OLIVE AVENUE

7075	MATHILDA AVENUE	AHWANEE AVENUE - ALMANOR AVENUE
7076	WOLFE ROAD	IRIS AVENUE
7077	SUNNYVALE SARATOGA ROAD	ALBERTA AVENUE - HARWICK WAY
7078	MARY AVENUE	KNICKERBOCKER DRIVE
7079	MARY AVENUE	CASCADE DRIVE
7080	BERNARDO AVENUE	WASHINGTON AVENUE
7081	MARY AVENUE	TICONDEROGA DRIVE
7082	SUNNYVALE SARATOGA ROAD	CHEYENNE DRIVE - CONNEMARA WAY
7083	MATHILDA AVENUE	INDIO WAY
7084	HOLLENBECK AVENUE	DANFORTH DRIVE
7085	MATHILDA AVENUE	SUNNYVALE AVENUE
7086	HOLLENBECK AVENUE	TORRINGTON DRIVE
7087	FREMONT AVENUE	MANET DRIVE - BOBWHITE AVENUE
7088	ARQUES AVENUE	OAKMEAD PARKWAY
7089	FAIR OAKS AVENUE	TASMAN DRIVE
7090	MAUDE AVENUE	PASTORIA AVENUE
7091	FREMONT AVENUE	REMBRANDT DRIVE
7092	JAVA DRIVE	GENEVA DRIVE
7093	STEWART DRIVE	DUANE AVENUE
7094	STEWART DRIVE	SANTA TRINITA AVENUE
7095	IOWA AVENUE	MURPHY AVENUE
7096	IOWA AVENUE	TAAFFE STREET
7097	WASHINGTON AVENUE	TOWN CENTER DRIVE
7098	KIFER ROAD	SEMICONDUCTOR DRIVE
7099	KIFER ROAD PEDESTRIAN SIGNAL	
7100	MATHILDA AVENUE	BORDEAUX DRIVE - FIRST AVENUE
7101	JAVA DRIVE	BORDEAUX DRIVE
7102	FAIR OAKS AVENUE	AHWANEE AVENUE
7103	TASMAN DRIVE	VIENNA DRIVE
7104	WOLFE ROAD	STEWART DRIVE
7105	OAKMEAD PARKWAY	LAKESIDE DRIVE
7106	CARIBBEAN DRIVE	BORREGAS AVENUE
7107	REED AVENUE	SEQUOIA DRIVE
7108	MARY AVENUE	MAUDE AVENUE
7109	FAIR OAKS AVENUE	FAIR OAKS WAY
7110	REMINGTON DRIVE	MANET DRIVE
7111	EVELYN AVENUE	BERNARDO AVENUE
7112	MARY AVENUE	CORTE MADERA AVENUE
7113	MATHILDA AVENUE	ROUTE 237 EB ON/OFFRAMP
7114	MATHILDA AVENUE	ROUTE 237 WB ON/OFFRAMP

7115	REED AVENUE	TIMBERPINE AVENUE
7116	CARIBBEAN DRIVE	TWIN CREEKS
7117	HOMESTEAD ROAD	BERNARDO AVENUE - ROUTE 85 ON RAMP
7118	MANILA DRIVE	H STREET
7119	MATHILDA AVENUE	SAN ALESO AVENUE
7120	MOFFETT PARK DRIVE	ROUTE 101 NB ONRAMP
7121	MOFFETT PARK DRIVE	LOCKHEED WAY
7122	OLD SAN FRANCISCO ROAD	GAIL AVENUE
7123	WOLFE ROAD	MARION WAY
7124	CARIBBEAN DRIVE	CROSSMAN AVENUE
7125	HOMESTEAD ROAD	KENNEWICK DRIVE
7126	MATHILDA AVENUE	TENNIS CENTER
7127	HOMESTEAD ROAD	BELLEVILLE WAY
7128	FREMONT AVENUE	WRIGHT AVENUE
7129	ELKO DRIVE	LAWRENCE STATION ROAD
FB	WB TASMAN DRIVE AT REAMWOOD AVENUE	
FB	WB KIFER ROAD AT CORVIN DRIVE	
FB	SB MATHILDA OVERPASS	
IPCL	MAUDE AVENUE AT BAYVIEW	
FB - FLASHING BEACON		
IPCL - IN-PAVEMENT CROSSWALK LIGHTS		

ATTACHMENT C
MONTHLY PREVENTIVE MAINTENANCE CHECKLIST

Intersection: _____ Number: _____

Date: _____ Start Time: _____ End Time: _____

A. CONTROLLER CABINET/SERVICE CABINET/UPS CABINET	
Appearance – Clean and vacuum cabinet, check and remove graffiti, posters and flyers.	☐
Door Fit, Gasket – Check door closure, plumb, gaskets still good, seal and weather tight.	☐
Lock Operation – Check lock operation. Lube all hinges and locks	☐
Fan Operation – Verify that fan turns on at 90°F and above.	☐
Cabinet Light – Verify that light works with door and light switch, replace cabinet light(s) if necessary	☐
Air Filter Condition – Check air filter, and replace if necessary	☐
Terminal Blocks – Check and tighten all TB for all wires, DLC, interconnect and power.	☐
Remarks: _____	

B. SIGNAL CONTROLLER	
Controller LEDs Working – Check all LEDs on controller, cards, flasher and load switches. Replace if LEDs not functioning	☐
Controller Display – Check & verify controller display is working.	☐
Timing and Coordination – Verify timing per chart, time set and coordination plan in place.	☐
Phases on Recall – Verify only main street on recall. If not report reason to Traffic Engineer.	☐
Detectors and Loops - Check operation of each detector card per cabinet print and per label on the shelves/DLC	☐
Isolators & Preempt – Check operation of all DC/AC isolators and preempt devices.	☐
Remarks: _____	

C. SIGNAL HEADS	
Lens Condition – Visually check for damage, wipe clean all lenses.	☐
Lamps and LEDs– Check for operation, proper orientation for arrows and seating of LEDs.	☐
3M Program Heads – Check for operation and proper programming.	☐
Signal Heads – Verify all signal heads are aimed properly.	☐
Remarks: _____	

D. PEDESTRIAN HEADS	
Aimed correctly – Check aiming of pedestrian heads, seating of LEDs, and functioning audible ped signals.	☐
Lens Condition – Check and clean pedestrian head lens.	☐

Remarks: _____

E. PEDESTRIAN PUSH BUTTONS	
Placing Calls – Check operation and placing calls of all pedestrian push buttons.	☐
Cover Plates – Check condition of all pedestrian push buttons plates and proper arrow orientation.	☐

Remarks: _____

F. MISCELLANEOUS	
Pull Boxes – Check for cracked, chipped and missing pullbox lids, replace if necessary.	☐
Mast Arm Signs – Check Mast arm signs for tightness, plumb and fade.	☐
UPS System – Check and test operations of UPS system.	☐
Communications equipment – visually inspect for proper operation, if malfunction noticed notify Traffic Engineer.	☐
Video Detection System – visually inspect for proper operation, if malfunction noticed notify Traffic Engineer.	☐
EMTRAC – visually inspect for proper operation, if malfunction noticed notify Traffic Engineer.	☐
Traffic Signal Poles – Check all poles & mast arms for damage, graffiti, posters, flyers, correct torque/tightness of anchor bolt nuts.	☐
Traffic Loop Lead-In and Stub-outs – Check for displaced asphalt around detector stub-out and check for coverage of all loop wire in slots, reseal if necessary.	☐

Remarks: _____

TECHNICIAN

NAME: _____

SIGNATURE: _____

DATE COMPLETED: _____

ATTACHMENT D
ANNUAL PREVENTIVE MAINTENANCE CHECKLIST

Intersection: _____ Number: _____

Date: _____ Start Time: _____ End Time: _____

A. ROADWAY/LOOPS CONDITION	
Pavement Condition at loops location - Visually check pavement condition around loops, reseal if necessary. Excellent ☐ Good ☐ Poor ☐ Cracked ☐ Needs Immediate Attention ☐	
Condition of the loops – Megger, test, and record results for all loops, report if any megged less than 10 at pull box	☐
Detector Cards – Check operation of each detector card per cabinet print and per label on the shelves/DLC	☐
Remarks: _____	

B. CONTROLLER CABINET/SERVICE CABINET/UPS CABINET	
Documentation Present - Check for logs, timing sheets, manual and cabinet prints, intersection drawings, etc.	☐
Ground Fault Interrupter – Check GFI operation	☐
Voltage Level at Entrance – Check and record voltage at terminal. VDC: _____ VAC: _____	☐
Controller Settings – Verify timing in controller matches timing sheets. No changes without Traffic Engineer Approval	☐
Controller Cabinet Clean – Vacuum and clean controller cabinet and service. Reseal conduits if necessary	☐
Replace filter, and check operation of the fan. Fan should be set at 90°F	☐
Check for loose and burned terminals – Tighten all DLC's, field wires and other conductors. Replace MOV & noise suppressors if bad or missing. Check breakers, replace if necessary.	☐
Check loadswitch leakage – Replace if over 5v AC	☐
Conflict Monitor – Test CMU for permissive and overlap operation while in flash and supply report.	☐
Hinges and Locks – Oil and lube hinges and locks for controller cabinet and service	☐
Remarks: _____	

C. AFTER DARK	
Traffic Signal – Check signal heads for visibility and operation at night	☐
Pedestrian Signals – Check pedestrian heads for visibility and operation at night	☐
Luminaires – Check luminaires for operation at night	☐
Internally Illuminated Street Name Signs – Check for operation and visibility of all signs, including Guide, Regulatory, and Warning Signs.	☐
Remarks: _____ _____	

D. INFRASTRUCTURE	
Condition of Paint – Framework, Signal Heads, Backplates, Cabinet, Service, poles, check paint condition.	☐
Ground Rod Clamp & Wire Present and Secure – Check ground rod & wire in controller cabinet and pullboxes	☐
Hand Hole covers, present and secure – Check hand hole covers for all poles replace if missing	☐
Pull boxes clean & lid in good conditions – Open, check and clean all pull boxes. Replace cracked lids, check and seal all conduits.	☐
Lens – Wipe clean all lenses and check condition of all at signal heads.	☐
Conditions of Splices – Check splices in all pull boxes	☐
LEDs – Check all Red, Amber & Green LEDs for light output & degradation with approved meter, remove and replace those that fall out of specs.	☐
3M Program heads – Check operation, programming and aiming or all signal heads	☐
Signal heads – Check aiming of all signal heads and tighten if necessary. Check, tighten backplates & visors replace if missing	☐
Mast Arm Signs & Hardware – Check all signs and hardware for tightness	☐
Relamping of all signals – Relamp bulbs with LED if applicable	☐
Remarks: _____ _____	

D. MISCELLANEOUS	
Red Light Detector Devices (a.k.a. Rat Boxes) – Check for burned devices if so remove and replace, clean and tighten if necessary.	☐
Check audible pedestrian indications – Clean, test and tighten if necessary.	☐
Video Detection System – Check programming and test operation of video detection system.	☐
Video Detection Cameras – Check for loose cameras, clean lenses with damped cloth (water only)	☐

UPS System – Check and test operations of UPS system, test battery voltage under load and not.	☐
EMTRAC – Test devices for operation. Notify Traffic Engineer if reprogram of unit is needed.	☐
MISCELLANEOUS (CONT.)	
Communication System – Check for proper operation of wireless communication equipment & SIC cable.	☐
4-Way flash operation – Test signal operation while on 4-way flash.	☐

Remarks:

_____

_____

TECHNICIAN

NAME: _____

SIGNATURE: _____

DATE COMPLETED: _____

ATTACHMENT E

CITY OF SUNNYVALE
STANDARD OPERATING PROCEDURES
BICYCLE AND PEDESTRIAN SAFETY THROUGH WORK ZONES

Warning sign types and locations:

- For any lane closures on the right side of the street there will be four required signs.
  1. Road Work Ahead
  2. Right /Bike Lane Closed Ahead (depending on the situation)
  3. A Bike Warning Sign - either W-79, Share the Road, or Watch for Bicyclists. Staff prefers using the Watch for Bicyclists sign.
  4. Lane/Bike Lane Closed (depending on the situation)

Bike lane closures:

- For any bike lane closures there will be four signs required.
  1. Road Work Ahead
  2. Right /Bike Lane Closed Ahead (depending on the situation)
  3. A Bike Warning Sign - either W-79, Share the Road, or Watch for Bicyclists. Staff prefers using the Watch for Bicyclists sign.
  4. Lane/Bike Lane Closed (depending on the situation)
- Staff will try to provide a 14 foot wide travel lane in situations where bicycles and cars will need to share a lane. If this is not achievable, the Caltrans minimum of 10 feet will be required.

Sidewalk closures:

- A clear pedestrian path will be provided through any sidewalk construction.
  1. This could be attained by
     a) creating a pathway on the sidewalk around the construction, or through the parking strip
     b) creating a coned or barricaded area off of the sidewalk,
     c) designating a flagger to escort pedestrians safely through the work zones
  2. If there is no clear pathway immediately available, pedestrians will be detoured. Any detour will include detailed signage. The pedestrian will be notified of the detour before they reached the construction sites so that no backtracking would be required. Elaborate pedestrian detours will be avoided if possible because staff has found them to be ineffective.
- Issues concerning provisions for people with disabilities will be handled on a case by case basis.

Sign placement for work zones that will not be closing any travel lanes:

- Work crews must warn roadway users of the work being conducted on the side of the roadway even when no travel lanes are being closed. In this situation, the warning signs will be placed off of the roadway as much as possible. Bicycle and pedestrian travel will be considered in the placement of the sign. Sign visibility and proximity to the work zone will also be considered.

Duration of work:

- Work crews may use their discretion regarding warning signs and traffic control on jobs that will last under 1 hour. Short duration work is defined as work that occupies a location up to one hour. It is appropriate to use colored or marked vehicles with rotating strobe lights, arrow panels or truck mounted signs in place of advance signs and channelizing devices.

Nighttime visibility :

- Retro reflective 28" cones will be used to barricade work zones at night.
- Barricades with reflective striping will be used to hold warning signs.
- Arrow boards will be used under some circumstances.
- All work being conducted by the city at night will only done on an emergency basis.

Storage of Equipment on-street:

- No storage of construction equipment or debris is permitted on the street outside of working hours.

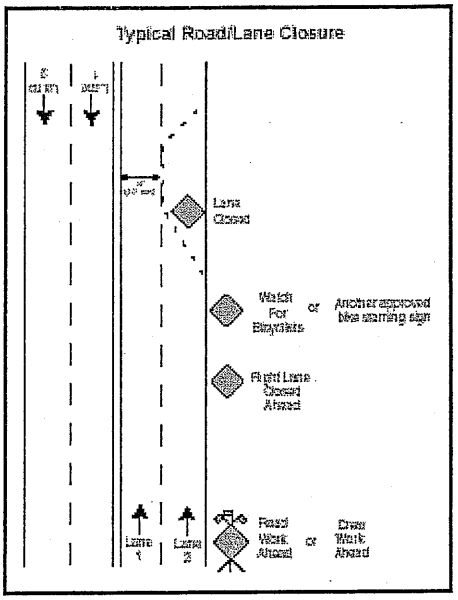
Outside contractor compliance:

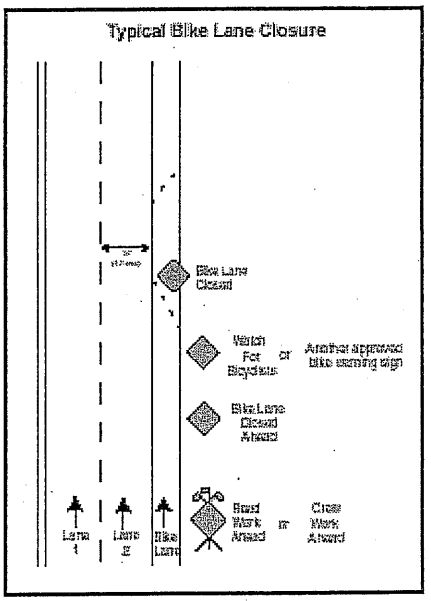
- Provide all encroachment permitees with a copy of the city's SOP.
  1. Make contractors aware ahead of time that they will be required to secure their own signs.
  2. Staff will continue to make announcements to sign vendors that the City will be requiring these signs.

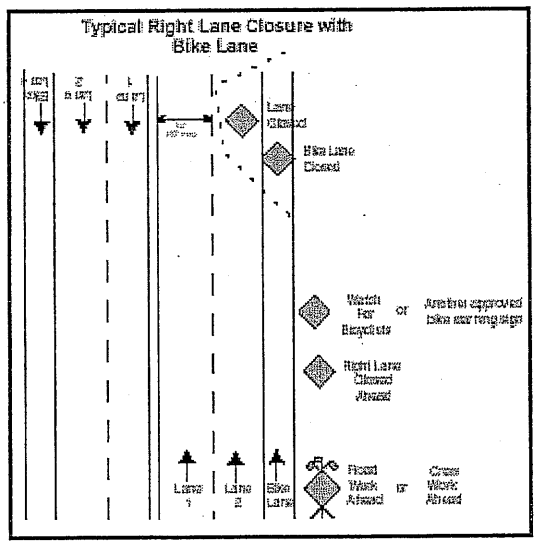
Complaint procedures:

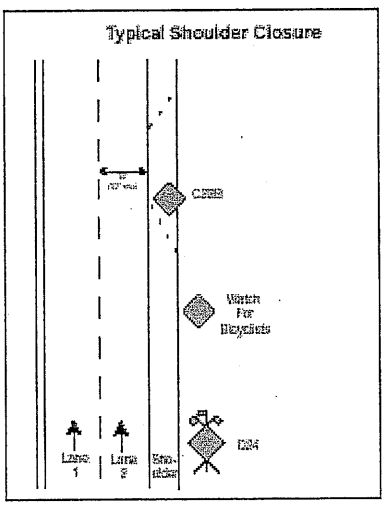
- For complaints related to work done by city crews, all complaints will be routed through the "field services" answer point.
- For complaints related to work done for capital projects or by contractors with encroachment permits, all complaints will be routed to the Project Administration division.

City of Sunnyvale
SOP for
Right Lane and Bike Lane Closures









DPW September 03

ATTACHMENT F
City of Sunnyvale Traffic Signal Standards

1. TRAFFIC SIGNAL & LIGHTING:

1.1 DESCRIPTION

Traffic signal and street lighting modifications are to be performed at the following location:

1.2 WARRANTIES

The five- (5) year warranty shall apply to all traffic control equipment listed below:

- Model 170E or 2070 Controllers
- Wireless Communication Hardware
- LED Red, Yellow, Green Vehicle and Pedestrian Signals
- Astro-Brac Vehicle Signal Mounting Hardware
- Detector Amplifiers

The traffic signal UPS system manufacturer shall provide a two (2) year factory-repair warranty for parts and labor on the UPS from date of acceptance by the City. Batteries shall be warranted for full replacement for two (2) years from date of purchase.

In addition all red, yellow, and green ball traffic signal modules, red, yellow, and green arrow traffic signal modules, and pedestrian hand/walking man modules, shall be performance warranted to be in compliance with July, 1998 ITE and CALTRANS minimum intensity standards for LED traffic signal modules, at 74 degrees centigrade, for a period of three (3) years. All warranty related measurements will be made at an applied voltage of 120 volts AC, within one-minute of signal module turn-on.

The respective manufacturers shall not be responsible for damage caused by negligence by others, acts of God, or use of equipment in a manner not originally intended. To obtain service under this warranty the City will deliver the control equipment to the manufacturer's designated address for repair. The manufacturer will repair and return the control equipment to the City within thirty (30) calendar days.

1.3 FOUNDATIONS

Sleeve nuts shall be used on Type 1-B standards.

Foundations for Type I-B standards shall conform to the details on State Standard Plan ES-6A, "Anchor Bolts With Sleeve Nuts", except that the bottom of the base plate shall be flush with the finished grade.

1.4 STANDARDS AND STEEL PEDESTALS

The sign mounting hardware, as shown on Detail U of State Standard Plan ES-6T, shall be installed at the locations shown on the plans.

All traffic signal mast arms shall include signal ports @ 5 foot intervals and flexible metal conduit between ports and signal heads.

All unused signal ports shall be plugged with square head pipe plugs.

1.5 PULL BOXES

Grout shall not be placed in bottom of pull boxes.

Where the sump of an existing pull box is disturbed by the Contractor's operations, the sump shall be reconstructed.

No. 3-1/2 pull boxes shall not be used. Contractor shall use a minimum of No. 5 or larger pull boxes unless otherwise indicated on plans.

All traffic signal pullbox lids shall be labeled "CSV Traffic Signal". Traffic signal pullboxes with fiberoptic or communications cables shall have the pullbox lids labeled "CSV Communications" and be either a N36 or N48 Electrical Box with a 10" or 12" concrete pullbox extension as indicated on the plans.

1.6 CONDUIT

All conduits to be installed across traffic lanes on or shall be installed using directional boring or open trench as determined by the Contractor. The Contractor shall determine clearance depths for utility crossings prior to conduit installation. Pull boxes shall be located behind the curb or as directed by the Traffic Engineer.

All open trenchs shall be backfilled with CLSM with a red dye admixture. The Contractor shall place a warning tape above the traffic signal conduit prior to backfilling the trench.

Top of the conduits shall be located at least 30" below the finished grade in all areas. All conduits shall have a pull tape installed, and a continuous No. 6 copper wire for grounding and tracing of conduits.

The Contractor shall not use 90° elbows only large radius 45° elbows shall be allowed.

All conduits shall be sealed with Duct-Seal after wires are installed to prevent moisture and rodents from entering the conduits.

1.7 WIRE AND WIRING

Signal cable shall not be used. Conductors and DLC's shall be installed as shown in the Conductor Schedule on the plans.

All Loop wire used shall be Type 2 Loop wire and Detector Lead-In Cables (DLC) shall be Type B lead-in cable. The Loop wire shall be suitable for use with Hot-Melt Rubberized Asphalt Sealant. The copper drain wire from the DLC shall be connected to the equipment ground in the controller cabinet. All DLC wires shall be twisted prior to landing on the detector input panel to prevent cross-talk and chatter.

Hot-Melt Rubberized Asphalt Sealant shall be used to seal all traffic detector loops slots. Asphaltic Emulsion Sealant and Elastomeric Sealant shall not be used.

1.8 SIGNAL INTERCONNECT CABLE

Signal Interconnect Cable (SIC) shall consist of 25 pair No. 20 AWG, minimum, stranded tinned copper conductors. Each conductor shall be insulated with 0.013 inch, minimum nominal thickness, color-coded, polypropylene material. The conductors shall be in twisted pairs, with color-coding to distinguish each pair. Each pair shall be wrapped with an aluminum polyester shield and have a No. 22 or larger, stranded, tinned copper drain wire inside the shielded pair.

The cable jacket shall be black, high density polyethylene, rated for a minimum of 300 volts and 60°C, and shall have a nominal wall thickness of 40 mils, minimum.

Splices of the Signal Interconnect Cable will only be allowed in the traffic signal controller cabinet.

Signal Interconnect Cable shall meet RUS PE-89 specifications.

1.9 SERVICE

Type III-AF service equipment enclosures shall be the aluminum type.

All overlapping exterior seams and doors shall meet the requirements for Type 3R enclosures specified in the NEMA Enclosure Standards. Continuous welding of exterior seams in service equipment enclosures is not required.

Type III-AF service equipment enclosures shall be configured and wired as shown on the plans or in the State of California Department of Transportation Standard Plans, July 1992, Std. Plan ES-2D, Page 217 unless otherwise detailed on the plans.

Service Cabinet shall be powder coated the same color as the traffic signal controller cabinet at the factory, Sunnyvale Beige with Anti-Graffiti Coating, color code Beige #TCIP009-BG02. The contractor shall submit a paint chip for approval by the Traffic Engineer.

1.10 SIGNAL HEADS

All traffic signal heads shall be furnished with red, yellow, and green LED's. The Contractor shall furnish all indications for traffic signal units.

The traffic signal housing doors, visors and backplate shall all be painted black. The traffic signal housing shall be painted olive green. No plastic traffic signal heads will be allowed.

1.11 SIGNAL HEAD MOUNTINGS

Adjustable Astro-Brac vehicle signal mounting hardware with terminal compartments, or equivalent, shall be provided for mast arm signal heads as noted on the plans.

Mast arm signals and mast arms shall include signal ports @ 5 foot intervals and flexible metal conduit between ports and signal heads.

All unused signal ports shall be sealed with a square head pipe plug.

All signal mounting assemblies including pipe fittings, post-top slip fittings, and terminal compartments shall be cast bronze.

1.12 DETECTORS

All detector amplifiers shall include LCD displays that indicate complete status and function setting of the detector including: loop frequency, loop inductance, delta L over L percent values, accumulated number of loop failure incidents since last reset, and a bar graph that displays inductance change to verify ideal sensitivity level setting. All detector amplifier functions shall be fully programmable from the front LCD menu. The detector amplifier shall be able programmable to emit an audible tone during detector activation.

The Contractor shall furnish and install one loop detector amplifier for each detector designation (i.e., 1I1U and 1I1L).

Where one detector consists of a sequence of 4 loops in a single lane, the front loop closest to the limit line or crosswalk shall be Type D and located one foot from the line. All loops shall be connected in series unless otherwise indicated on the plans.

1.13 PEDESTRIAN SIGNALS

The Contractor shall supply and install Type A pedestrian signals.

All pedestrian signals shall be furnished with a combination Portland Orange "Up-Raised Hand", and Lunar White "Walking Man" LED's. All pedestrian indication symbols shall be completely filled in, outlined indications shall not be allowed. LED Pedestrian indications shall also have a "Countdown Indication" showing the remaining Walk/Don't Walk time.

The Countdown Pedestrian Signal shall be user configurable through dipswitches allowing the user to deactivate the countdown operation or activate countdown of Walk+Don't Walk time, countdown of Walk time and then Don't Walk time and countdown of Don't Walk time only.

Type SP-1-T mountings shown on the State Standard Plan ES-3B shall have a lower mounting bracket attached to the pedestrian signal housing in the same manner as the SP-2-T mounting.

1.14 PEDESTRIAN PUSH BUTTONS

All pedestrian push button assemblies shall be Type B (5" x 7.5") per State Standard Plan ES-5C. Pedestrian push button signs shall be the international type (5" x 7.5"). Pedestrian push buttons shall be 2" ADA pushbuttons and be mounted 36" above the adjacent pavement.

All pedestrian pushbutton plates shall be secured to the pedestrian pushbutton assembly with 8-32 x 3/8" button head torx tamperproof stainless steel screws.

All 2" ADA pedestrian pushbuttons shall be secured to the pedestrian pushbutton assembly with 8-32 x 1" button head torx tamperproof stainless steel screws.

The contractor shall provide two (2) torx tamperproof keys to the City.

1.15 PHOTOELECTRIC CONTROLS

Contractors shall be the mechanical armature type.

Photoelectric control shall be installed in accordance with Section 86-6 of the State Standard Specifications.

The contractor shall supply a photoelectric control unit to be used as a spare.

1.16 INTERNALLY ILLUMINATED STREET NAME SIGNS

The Contractor shall supply and install Type A IISNS double faced in accordance with the State of California, Department of Transportation, Standard Plan ES-33 and Standard Specification 86-6.065, and these Special Provisions:

The Contractor shall supply Hawkins Adjustable IISNS brackets and mounting hardware or an approved equal.

All sign faces shall include the street name, block numbers, and the City of Sunnyvale logo.

The sign faces shall be fabricated from flexible, colored, wide-angle prismatic retroreflective sheeting tape and related processing material designed to enhance the visibility of the traffic control signs. The retroreflective sheeting for sign faces/finished signs shall have a smooth surface with a distinctive interlocking diamond seal pattern and orientation marks visible from the face. The sheeting shall be preaccepted with a pressure sensitive adhesive backing protected by a removable liner. The adhesive shall require no heat for proper bonding when applied in accordance with the manufacturers recommendations to substrates 65 degree F or above. The retroreflective sheeting shall be 3M, "Scotchlite", Diamond grade White Sheeting #3990, the green sheeting shall be 3M Green #1177, the yellow, blue, and black used in the Sunnyvale City logo shall be Spar-Cal Golden Yellow #1827, 3M Blue #1175 and 3M Black #1178, respectively.

1.17 MODEL 170E OR 2070 CONTROLLER ASSEMBLIES

All controller assemblies shall be furnished by the Contractor and shall include Model 170E controllers unless 2070 controller are specified in the plans.

The controller cabinet shall be powder coated the same color as the Type III-AF service cabinet at the factory, Sunnyvale Beige with an Anti-Graffiti Coating, color code Beige #TCIP009-BG02. The contractor shall submit a paint chip for approval by Traffic Engineer.

All controller assemblies shall conform to Section 86-3.11 of the State Standard Specifications. The first two paragraphs of that section are amended to read as follows:

Model 170E controller assemblies shall consist of a Model 170E controller unit, a fully wired cabinet and all auxiliary equipment required to control the system as shown on the plans, as specified in these Technical Specifications and as specified in Sections 86-3.01, "Controller Assembly" also including two (2) fluorescent lighting fixtures (front/back of cabinets), a Siecor Rack-Mount Fiberoptic Splice Enclosure, and a pullout drawer/shelf. The traffic signal controller cabinet shall have 2 hooks welded inside the front door and back door used to hang a factory

supplied resealable document holders. The flourescent lighting fixtures shall be mounted to the interior roof of the controller cabinet not to the 19" rack cage.

Rack-Mount Fiberoptic Splice Enclosure shall accommodate up to 12 splices of fiberoptic cable with ST connectors.

Model 170E controller assemblies shall conform to the requirements in "Traffic Signal Control Equipment Specifications," issued by the State of California, Department of Transportation, and to all addendums thereto current at the time of project advertising.

Attention is directed to Section 209-2.42 "Conductor Identification" of the *City of Sunnyvale Standard Specifications for Public Works Construction 2000 Edition and Standard Details for Public Works Construction 2000 Edition.*

Model 170E traffic signal controller units shall be furnished with the latest version BiTran Traffic Signal Program 233 and 412/C Memory Module. Controllers shall be furnished with the necessary modems for interconnection and for dial-up to the existing City of Sunnyvale BiTran QuicNet system. Internal modems for the traffic signal controller shall be capable of communicating at a 9600-baud rate.

If 2070 traffic signal controllers are specified, units shall be full 2070(aka:Heavy/Dark), 2070 Lite traffic signal controllers are not acceptable. 2070 controllers shall be furnished with a Field I/O Module, C1 connector for 170 controller cabinets, C11S connector, a 8 line x 40 character backlit LCD display panel, 3.5 Amp power supply module, 2 Asynchronous serial communications ports, VME cage assembly, an Ethernet port connection, and the necessary modems/communication ports for interconnection utilizing twisted pair/fiberoptic cable and for dial-up to the existing City of Sunnyvale BiTran QuicNet system capable of communicating up to a 9600-baud rate. 2070 traffic signal controllers shall be provided with the latest BiTran Traffic Signal Program 233 software for 2070 controllers.

The supplier of the Traffic Control Equipment is required to furnish engraved plastic labels to be installed on all conductors in the bottom of the controller cabinet by the Contractor's field personnel.

The Contractor shall arrange to have a signal technician, qualified to work on the controller unit and employed by the controller unit manufacturer or his representative, present at the time the equipment is turned on.

1.18 TRAFFIC SIGNAL CONFLICT MONITOR

The traffic signal conflict monitor shall be configured for operation with 170E, 179, or 2070 traffic signal controller. The monitor shall provide the following functions in addition to those requirements set forth in the Caltrans Traffic Signal Control Specifications: enhanced functions of Red signal monitoring, dual indication monitoring, clearance monitoring, provide a RYG full intersection display, provide a RS232 port to communicate with the traffic signal controller or personal computer, and store monitor status, event logs, and signal sequence history logs in nonvolatile memory for diagnostic and archival purposes. A communications cable shall be provided to allow communication between the traffic signal conflict monitor and the traffic signal controller through the RS232 ports. The conflict monitor shall be an EDI 2010ECL or approved equal.

1.19 TRAFFIC SIGNAL UPS SYSTEM

The traffic signal UPS system (UPS) shall include, but not be limited to the following: inverter/power transfer relay, with a maximum transfer time of 150 milliseconds, batteries and charging circuitry, a separate manually operated non-electronic bypass switch and all necessary hardware and interconnect wiring. The UPS shall provide reliable emergency power to a traffic signal in the event of a power failure or interruption. The UPS shall be capable of providing power for full run-time operation for an "LED-only" intersection (all colors red, yellow, and green). The UPS shall be designed for outdoor applications, in accordance with the Caltrans Transportation Electrical Equipment Specifications (TEES), dated November 19, 1999, Chapter 1, Section 8 requirements.

The UPS shall be installed and tested by an authorized UPS manufacturer representative prior to the activation of the traffic signal. The Contractor shall arrange to have a manufacturer representative, qualified to work on the UPS and employed by the UPS unit manufacturer or his authorized representative, present at the time the equipment is turned on.

OPERATION

The UPS shall provide a minimum four (4) hours of full run-time operation for an "LED-only" intersection (minimum 700W/1000VA active output capacity, with 85% minimum inverter efficiency).

The Traffic UPS shall be capable of producing – simultaneously -- fully regenerated, conditioned and true sine wave, standby and continuous AC outputs. Suggested operating mode for respective outputs during power failure: Continuous output provided for signal controllers and modems; Standby output provided for signals in flash mode operation (optional delay timer available for short-term battery run under full cycling operation).

The UPS shall consist of four major components, the Electronics Module, the Power Interface Module, separate By-Pass switch, and the Battery System.

The UPS manufacturer shall supply a 9 pin DB9 to DB9 straight through cable to provide communications between the UPS unit and laptop computer.

The Electronics Module shall consist of the following: True sine wave, high frequency inverter utilizing IGBT technology, 3-stage, temperature compensated, battery charger, and for connection from the Electronics Module to the Power Interface Module and Battery System, dedicated harnesses shall be provided with quick-release, keyed, circular connectors and braided nylon sleeving over all conductors, local and remote control of UPS functions, local and remote communications capabilities, and be capable of accepting an NTCIP-ready adapter or a Spread Spectrum Radio modem.

The UPS shall also have a Power Interface Module (PIM) for inserting power safely and reliably.

Upon loss of utility power the Traffic UPS shall insert battery power into the system via a supplied Power Interface Module (PIM). In case of UPS failure and/or battery depletion, the PIM will ensure that the UPS will drop out and, upon return of utility power, the traffic control system will default to normal operating mode. The Power Interface Module shall enable removal and replacement of the Traffic UPS without shutting down the traffic control system (i.e. "hot swap" capability). Connectors shall be equipped with a "safety interlock" feature.

For type 170 style cabinets, upon loss of power the Traffic UPS shall actuate the existing Flash Transfer Relays (FTRs) and Mercury Contactor (MC) to force the traffic control system into Flash Mode operation if the intersection is to be operated in Flash upon loss of power. Existing Flasher Modules and Flash Transfer Relays shall be utilized. To facilitate emergency crews and police activities, the Traffic UPS shall be compatible with police panel functions (i.e. "Signals OFF" switch must kill power to the field wiring even when on UPS/Battery power). The Traffic UPS shall not duplicate or take over flash operation or flash transfer relay functions.

The Traffic UPS shall be capable of providing continuous, fully conditioned, regulated, sinusoidal (AC) power to selected devices such as signal controllers, modems, communications hubs, NTCIP adapters and video equipment.

The UPS shall be capable of removal and/or replacement of the UPS or any of its components without shutting down the traffic control system (i.e. "hot swap" capability).

To facilitate emergency crews and police activities, the Traffic UPS shall be compatible with police panel functions (i.e. "Signals OFF" switch must kill power to the field wiring even when on UPS/Battery power).

The UPS shall provide the user with 3-sets of normally open (NO) and normally closed (NC) single-pole double-throw (SPDT) relay contact closures, available on a panel-mounted terminal block, rated at a minimum 120V/1A, and labeled so as to identify each contact. The first set of NO and NC contact closures shall be energized whenever the unit switches to battery power. Contact shall be labeled or marked "On Batt."

The second set of NO and NC contact closures shall be energized whenever the battery voltage approaches approximately 40% of remaining useful capacity. Contact shall be labeled or marked "Low Batt." The third set of NO and NC contact closures shall be energized two hours after the unit switches to battery power. Contact shall be labeled or marked "Timer."

The UPS shall have an Adjustable Delay-timer to provide up to 10 hours of full cycling while on battery before switching to flash mode (only available where 100% low-power/LED signals and pedestrian heads are used).

Operating temperature for both the inverter/power transfer relay and manual bypass switch shall be -37 □C to +74 □C. Both the power transfer relay and manual bypass switch shall be rated at 240VAC/30 amps, minimum.

The UPS shall use a temperature-compensated battery charging system. The charging system shall compensate over a range of 2.5 – 4.0 mV/□C per cell. Batteries shall not be recharged when battery temperature exceeds 5°C □□°C.

UPS shall bypass the utility line power whenever the utility line voltage is outside of the following voltage range: 100VAC to 130VAC ±2VAC).

When utilizing battery power, the UPS output voltage shall be between 110 VAC and 125 VAC, pure sine wave output, 60Hz □3Hz.

UPS shall be compatible with Caltrans Model 332/333 cabinets, Model 170 controllers, Model 2070 controllers and cabinet components for full time operation.

When the utility line power has been restored at above 105VAC □2 VAC for more than 30 seconds, the UPS shall dropout of battery backup mode and return to utility line mode. UPS shall be equipped to prevent a malfunction feedback to the cabinet or from feeding back to the utility service. In the event of inverter failure, battery failure or complete battery discharge, the power transfer relay shall revert to the NC state, where utility line power is reconnected to the cabinet.

Recharge time for the battery, from "protective low-cutoff" to 80% or more of full battery charge capacity, shall not exceed twenty (20) hours.

MOUNTING/ CONFIGURATION

Complete UPS shall fit inside a typical, fully equipped Caltrans Model 332 or 333 Cabinet that includes one Model 170 or 2070 controller.

A separate, stand-alone, pad-mounted, outdoor (NEMA 3R) enclosure shall be available should there be inadequate room in the signal cabinet or should the traffic engineer prefer independent, external mounting.

Mounting method shall be shelf-mount, rack-mount, swing-tray mount or combination of either. Front-mounted available rack space is approximately 6 inches.

All necessary hardware for mounting (shelf angles, rack, etc) shall be included with the UPS. If swing-trays are used, a minimum of 6 bolts/fasteners shall be used to secure it to the 19" cabinet rack. Bolts/fasteners and washers shall meet the following requirements:
Screw type: Pan Head Phillips machine screw
Size and Thread pitch: 10-32
Material: 18-8 stainless steel (Type 316 stainless steel is acceptable as an alternate)
Washer: Use one flat washer (18-8 stainless steel) under the head of each 10-32 screw (provided that the screws are properly tightened, lock washers are unnecessary.)
Number of screws per swivel bracket, minimum: 6 screws (minimum) per swivel bracket. Spaced evenly along bracket, with one screw near each end.

MAINTENANCE, DISPLAYS, CONTROLS AND DIAGNOSTICS

The UPS shall include a display and /or meter to indicate current battery charge status and conditions. The UPS shall have lightning surge protection compliant with IEEE/ANSI C.62.41. The UPS shall be equipped with an integral system to prevent battery from destructive discharge and overcharge.

The UPS shall be easily replaced with all needed hardware and shall not require any special tools for installation.

The UPS shall include a resettable front-panel event counter display to indicate the number of times the UPS was activated and a front-panel hour meter to display the total number of hours the unit has operated on battery power.

The traffic UPS shall come standard with a DB-9F connector with open collectors (40 V @ 20 mA) indicating: Loss of Utility Power, Inverter Failure, and Low Battery.

An RS232 Interface shall be provided via a DB-9F connector allowing full, interactive, remote computer monitoring and control of the UPS functions.

The UPS shall have front panel controls for: Power ON, Cold (DC) Start, Alarm Silence, Battery Test, Bypass Breaker, and DC/Battery Breaker.

Manufacturer shall include two (2) sets of equipment lists, operation and maintenance manuals, and board-level schematic and wiring diagrams of the UPS, and the battery data sheets.

The calculated MTBF for the UPS is 100,000 hours based on component ratings. When Bypass and Power Interface Module are included, system MTBF increases to 150,000 hours.

BATTERY SYSTEM

Individual batteries shall be 12V type, 65 amp-hour maximum, and shall be easily replaced and commercially available off the shelf. Batteries used for UPS shall consist of 4 to 8 batteries with a cumulative minimum rated capacity of 240 amp-hours. Batteries shall be deep cycle, sealed prismatic lead-calcium based AGM/VRLA (Absorbed Glass Mat/ Valve Regulated Lead Acid). Batteries shall be certified by the manufacturer to operate over a temperature range of – 2□°C to +7□°C. The batteries shall be provided with appropriate interconnect wiring and corrosion-resistant mounting trays and/or brackets appropriate for the cabinet into which they will be installed. Batteries shall indicate maximum recharge data and recharging cycles. The batteries

shall be secured to racks or trays to prevent undesired movement in the traffic signal controller cabinet.

Hydrogen gas emissions from the batteries must meet Mil-Spec #MIL-B-8565J

The interconnect cable shall be protected with abrasion-resistant nylon sheathing. The interconnect cable shall connect to the base module via a quick-release circular connector. For purposes of safety and proper operation, the circular battery connector shall have interlocking pins to prevent turn-on if batteries are not connected, and to shut off the UPS should the batteries be disconnected. Battery construction shall include heavy-duty, inter-cell connections for low-impedance between cells, and heavy-duty plates to withstand shock and vibration. The top cover shall use tongue and groove construction and shall be epoxied to the battery case for maximum strength and durability. A lifting handle shall be available on all battery models.

1.20 CONTROLLER ASSEMBLY TESTING

The Contractor shall have the controller assembly tested by:

Peek - Signal Maintenance Inc. (SMI)
3375 Woodward Avenue
Santa Clara, CA 95054
(408) 988-5541

Approximately 21 days will be required for testing.

The Contractor shall be responsible for the cost of controller assembly testing, delivery and pick-up.

1.21 EMERGENCY VEHICLE PREEMPTION EQUIPMENT

Contractor shall supply and install Emtrac fire preemption equipment per Sunnyvale Standard Specification 307-4.16. All Emtrac enclosures shall be waterproof. The EMTRAC fire preemption receiver shall be installed in the traffic signal controller cabinet by the manufacturer's representative prior to the start of the 21-day controller assembly testing.

1.22 LED (Light Emitting Diode) TRAFFIC SIGNAL MODULES

GENERAL DESCRIPTION

This specification covers LED pedestrian signal modules for 16" housings. It also covers red, green, and yellow LED modules to be used in place of the incandescent lamp, reflector, socket, gasket, and lens assembly of the vehicle signal sections. This technical performance specification is applicable to new construction projects and also to retrofit of existing signalized intersections.

Referenced vehicle type LED modules shall fit in all standard, incandescent vehicle traffic signal housings. Each module shall be complete and shall incorporate a red lens for red modules, a yellow lens for yellow modules, and a green lens for green modules. Each module shall also incorporate a printed circuit board inclusive of all of the LEDs and required circuit components, 36 inch 16 AWG wire leads with strain relief and spade terminals, a rigid housing for protection in shipping, handling and installation, and a one piece neoprene gasket. *Screw-in* type products are not allowed for vehicle signals. Red, Amber and Green *ball* type signals shall utilize the *LumiLeds* (1) light engine as their source of illumination. Lenses for *ball* type modules shall be made of ultraviolet stabilized polycarbonate, and incorporate facets that serve to enhance the

optical efficiency of the LED traffic signal module. Individual *lens-lets* are specifically not allowed. The *ball* type signals shall incorporate an inner lens that is sealed to the lamp housing, and serves to collimate the light emitted by the *LumiLeds* (1) light engine. An outer lens shall also be incorporated, that serves to focus the *collimated* light, so as to meet ITE intensity and distribution standards. Additionally, the lamp shall almost perfectly, approximate to the motorist, the appearance of an incandescent traffic signal. This means that the face of the ball LED lamp shall appear to the motorist as nearly totally uniform in illumination, and have a wide viewing angle that makes it suitable for installation on wide boulevards or single-tethered span wire. This also means that it shall not be apparent that LEDs are used as the light source for the red traffic signal ball. The external lens surface for all vehicle signals shall be smooth, with no raised features, so as to minimize the collection of dirt, diesel smoke, and other particulate contaminates, and to facilitate periodic cleaning. External lens facets are not allowed. The LEDs shall be mounted and soldered to a printed circuit board. The LED signal module shall be watertight when properly installed in a traffic signal housing. The LED signal module shall utilize the same mounting hardware used to secure the incandescent lens and gasket assembly and only require a screwdriver or standard installation tool to complete the mounting. The LED signal module assembly shall weigh less than 5 pounds.

The housing of the LED signal module shall be marked 'TOP' to designate the proper orientation of the LED signal module in the traffic signal housing. Manufacturers part number, date code, and electrical characteristics of the LED signal module shall be visible on the rear of the assembly. The lens shall be keyed to the housing of the LED signal module to insure the proper orientation and to avoid possible rotation during any handling.

The housing of LED ball type traffic signal modules shall utilize a *partial, embedded and integral metal layer*, in its design and construction.

OPTICAL

The light intensity and distribution from red LED signal modules and pedestrian signals, shall as a minimum, meet the July, 1998 ITE and current CALTRANS standards and measurement criteria for LED traffic signal modules, even after a 30 minute warm up of continuous operation. Green LED signals shall be certified to meet the July, 1998 ITE intensity requirements @ 74 degrees centigrade. Test data to verify the performance for red and green ball signals as meeting the ITE intensity requirements @ 74 degrees Centigrade, shall be supplied from either:

Lighting Sciences
7630 East Evans Road
Scottsdale, AZ 85260

ETL Testing Laboratories
3933 US Route 11
Cortland, NY 13045-0950

or, other certified **independent** test lab. The light output of all LED vehicle signal modules and LED pedestrian "hand" signal retrofit kits shall meet *ITE* specifications for chromaticity.

The LEDs shall be connected in series parallel strings. For LED ball type signals, the failure of a single LED shall cause loss of light from only that LED. No loss of light output from the complete module assembly shall occur as a result of a single LED failure in a LED ball lamp.

For LED lamps, so as to prevent *current hogging* of the LEDs, *cross-linking* of every LED is specifically not allowed. For LEDs, no less than 4 LEDs are allowed to be crossed-linked, or electrically grouped together, so as to minimize this current hogging effect.

The control circuitry shall prevent the current flow through the LEDs in the off state to avoid any false indication as may be perceived by the human eye, during daylight and *evening* hours. The LED traffic signal module shall be operationally compatible with NEMA TS - 1 and NEMA TS - 2 *conflict monitoring* parameters. The intensity of the LED signal module shall not vary by more than 10% over the allowable voltage range as specified in the electrical section below.

The ball indications shall maintain not less than 90% of the required intensity, as defined by the July, 1998 ITE intensity standards for LED traffic signal modules, over the temperature range of -40 degrees centigrade to +74 degrees centigrade, at 120 volts A.C., when new, and also after 4 years of field installation.

ELECTRICAL

The LED signal module shall operate over the temperature range of -40°C (-40°F) to +74°C (+165°F). Power factor shall be 90% or greater, at nominal rated voltage, at 25°C, after 60 minutes of operation. Total harmonic distortion (THD) shall be less than 20% at rated voltage, at 25°C.

All LED traffic signal modules shall be in compliance with FCC noise regulations.

The red, yellow, and Portland Orange LEDs shall utilize exclusively AlInGaP technology, either AS (Absorbing Substrate) or TS (Transparent Substrate), and shall not exhibit degradation of more than 30% of their initial light intensity following accelerated life testing (operating at 85 degrees C and 85% humidity, for 1000 hours). AlGaAs technology is not acceptable.

The green LEDs shall utilize gallium nitride technology.

The LED signal modules shall be connected directly to line voltage, **120 Volts AC nominal**, and shall be able to operate over the voltage range of 80 VAC to 135 VAC.

The 8" and 12" *red ball* units shall consume no more than a *nominal* 7 and 10.5 watts respectively, at 120 VAC, at 25 degrees centigrade.

Type "S" green ball LED traffic signal modules shall consume no more than a nominal 6 and 12 watts for the 8" and 12" lamps, respectively.

Type "E" (expanded viewing angle or span wire application) green LED ball traffic signal modules shall consume no more than a nominal 9 and 19 watts for the 8" and 12" lamps, respectively.

Yellow LED ball traffic signal modules shall consume no more than a nominal 18 and 30 watts respectively, for the 8" and 12" *balls.*

Red arrow type LED traffic signal modules shall be temperature-compensated so as to maintain intensity at elevated temperatures. Red arrow type LED traffic signal shall be tested and documented by CAL TRANS as being in compliance with CAL TRANS intensity standards for red arrows at elevated temperatures.

Stand-alone pedestrian *hand* signal LED retrofit kits shall be Portland Orange and consume no more than a nominal 12.5 watts at 25 degrees Centigrade and shall be a *filled-in figure* symbol. *Outline* type symbols are not acceptable for *hand* symbols. Stand-alone pedestrian *hand* signals shall be temperature-compensated so as to maintain intensity at elevated temperatures. Stand-alone ped *hand* signals shall be tested and documented by CALTRANS as being in compliance with CALTRANS specifications for intensity at elevated temperatures.

Combination *hand-walking person* LED Pedestrian signal modules shall incorporate a Lunar-white walking person symbol. It shall be a filled-in type symbol. In order to insure accurate color transmittance, the module shall incorporate a replacement lens that is precisely matched to the dominant wavelength of the LEDs. The hand and walking person symbols shall be overlaid on top each other so that the illuminated image appears to be in the middle of the signal housing. The hand symbol shall also be filled-in. Outline symbols for the hand and/or walking-person are not acceptable. The hand and walking person symbols in the combination module, shall consume no more than a nominal 9.7 and 8.5 watts each, respectively.

Transient voltage suppression rated at 1500 watts for 1 millisecond and fusing with a maximum rating of 2 amps shall be provided to minimize the effect and repair cost of an extreme over voltage situation or other failure mode.

(1) LumiLeds is a trademark of LumiLeds Corporation.

SPARE EQUIPMENT

The contractor shall supply one spare LED of each color (Red, Yellow, Green, Portland Orange, Lunar White), for each type (12" Ball, 12" Arrow, 8" Ball, Pedestrian Indication) supplied for this project.

1.23 WIRELESS COMMUNICATION EQUIPMENT

The wireless communication equipment shall use spread spectrum radio technology to allow communication between controllers with equal or superior function to signal interconnect cable. The wireless communication equipment shall include radio modems, directional antenna, cabling, and software required to transmit communication between controller assemblies. The Contractor shall have a authorized manufacturer's representative present on the day of the traffic signal turn-on to program and fine-tune the wireless communication equipment.

a. Spread Spectrum Radio Interconnect Equipment-The Contractor shall install spread spectrum radio-based interconnect equipment. The spread spectrum radio communications equipment shall be based upon a point-to-multi-point spread spectrum technology.

The purpose of the communications equipment is to provide a data link between the central traffic signal control system and the local signal controllers.

The radio shall be certified for use with the Bitrans Quicnet Traffic Signal Control Program Version 4.0. Written documentation of this certification shall be provided to the Engineer for approval.

The radios shall operate with the Model 170E controller-based traffic signal control and shall be transparent to the system (i.e., fully capable of operating with the communications protocol required by the traffic signal control system). These features of the installed system shall be well documented.

The radios shall meet FCC Part 15.247 requirements for unlicensed use, and operate with a communications protocol that is transparent to the central traffic signal control system (i.e., the radios shall be compatible with the central traffic signal control system communications protocol and with the configurations of the central traffic signal control system). The radios shall be able to function as either a master, repeater or remote, and use direct sequence techniques to spread the radio frequency (RF) carrier. The radios shall be encased in a hardened unit and meet the National Electrical Manufacturer's Association (NEMA) TS-1 environmental standards for traffic signal equipment. Other features to be provided by the radio are the following:

1) operate in the 2.4000 to 2.4835 GHz radio frequency range
2) provide for installation in the controller cabinet
3) offer at least nine user-selectable channels, with at least five non-

overlapping channels

4) allow connection to either an omni-directional or directional antenna
5) offer point-to-point, point-to-multi-point and repeater capability
6) user-selectable power output (one watt, maximum as outlined by the FCC)
7) provide RS-232 interface
8) operate with 110 VAC

b. Radios, Antennas, Cabling and Connections--The Contractor shall install the remote radios inside the controller cabinets of the project signals as designated in the plans and as described in these specifications. The only portion of the radio that shall be installed outside the controller cabinet shall be the radio antenna. The antenna for the remote radios shall be installed by the Contractor at a location on a signal pole or street light pole at the intersection as determined in cooperation with the Engineer. All cabling and connections from the remote radios to the local controller and the antenna shall be installed by the Contractor in cooperation with the Engineer.

The Contractor shall use the facilities within the radio as well as external test equipment to maximize the signal strength through antenna placement and aim. This shall also include testing the 2.4000 to 2.4835 GHZ radio spectrum for signals that may interfere with the operation of the radios to be installed. The Contractor shall make adjustments to the radio to minimize the impact of any potential interference.

The Contractor shall provide the Engineer with written documentation of this testing. This documentation shall include printouts from the testing equipment. The Contractor shall also provide written documentation of all switch or jumper settings for each radio installed.

The Contractor shall install the 120-volt power connection such that it will not become disconnected by vibration of thermal stresses in the controller cabinet. The Contractor shall work with the signal maintenance staff to accommodate this requirement.

c. Antennas-Antennas shall be directional antennas compatible with the spread spectrum radio system.

Directional antennas shall be Yagi antennas, having a minimum of 16 dBi gain, connected with coaxial cable to the radios. The directional antennae shall be as recommended by the radio manufacturer. The directional antennas shall be installed at the local intersections.

All antenna mounting equipment shall be stainless steel or galvanized, and shall be furnished by the Contractor. The connections between the antenna and the coaxial cable feed shall be sealed to prevent moisture intrusion into the connection.

d. Cabling and Connections-Cabling and connections shall be materials intended for use with the radios and antennas.

The cable connecting the radios to the antenna shall be as follows or as recommended by the radio manufacturer. The cable between the directional antennae and radios shall be Times Microwave LMR4OO. The cables shall be suitable for installation in underground locations susceptible to moisture.

All exterior connections shall be taped and sealed to prevent moisture intrusion as directed by the traffic engineer.

e. Spare Equipment-The contractor shall provide one spare spread spectrum radio, up/down converter, directional YAGI antenna, cables to connect up/down converter to lightning suppressor, cable to connect radio to traffic signal controller and lightning suppressor, and lightning suppressors for the cabinet and antenna.

1.24 NUMBERING ELECTRICAL EQUIPMENT

The placement of numbers on electrical equipment will be done by others.

1.25 REMOVING AND SALVAGING ELECTRICAL EQUIPMENT

All salvaged electrical materials shall be hauled to a City of Sunnyvale facility and stockpiled. The Contractor shall coordinate all such activities through the Public Works Construction Inspector.

The Contractor shall provide equipment, as necessary, to safely unload and stockpile the material. All salvaged controller cabinets and electrical equipment shall be securely fastened or bolted to wooden pallets. A minimum of two working days notice shall be given prior to delivery.

2. SIGNING, STRIPING & MARKINGS:

2.1 REMOVE TRAFFIC STRIPES AND PAVEMENT MARKINGS

Where blast cleaning is used for the removal of thermoplastic traffic stripes and pavement markings or for removal of objectionable material, and such removal operation is being performed within 10 feet of a lane occupied by public traffic, the residue including dust shall be removed immediately after contact between the sand and the surface being treated. Such removal shall be by a vacuum attachment operating concurrently with the blast cleaning operation.

2.2 REMOVE ROADSIDE SIGNS

Existing roadside signs and/or sign posts, at locations shown on the plans to be removed, shall be removed and salvaged to the City's Corporation Yard at 221 Commercial Avenue, Sunnyvale.

Existing roadside signs shall not be removed until replacement signs have been installed or until the existing signs are no longer required for the direction of public traffic, unless otherwise directed by the Engineer.

2.3 RELOCATE ROADSIDE SIGNS

Existing roadside signs shall be removed and relocated at new locations shown on the plans.

Each roadside sign shall be installed at the new location on the same day the sign is removed from its original location.

2.4 INSTALL ROADSIDE SIGNS

Roadside signs shall be installed at the locations shown on the plans or where directed by the Engineer, and shall conform to the provisions in Section 56-2.01 through 56-2.04, "Roadside Signs," of the State Standard Specifications.

2.5 THERMOPLASTIC TRAFFIC STRIPES AND PAVEMENT MARKINGS

All new striping (including lane lines) and legends shall be thermoplastic.

The State Specification No. for glass beads in Section 84-202, "Materials," of the Standard Specifications is amended to read "8010-21C-22 (Type II)."

2.6 RESTORATION OF CURB MARKINGS

Contractor shall reference out and restore any curb markings (S-indicating sanitary sewer lateral; W-indicating water service lateral; arrows and Roman Numerals-indicating ties to water main valves; high-pressure gas main) that may be destroyed by its work. In the case of construction of curb ramps where the vertical curb is eliminated new ties to water valves shall be made on the closest available vertical curb with proper direction of arrows and proper distances from water valve to tie indicated in three-inch (3") high Roman Numerals.

2.7 RESTORATION OF PAVEMENT STRIPING AND MARKINGS

The Contractor shall repaint any pavement striping or markings that are damaged by trenching or other operations during the course of the project. The entire stripe element (individual stripe) or marking (cross walk lines, turn arrows, etc.) shall be repainted—"touch ups" will only be allowed if approved by the Engineer.

The painting materials used for striping shall match the existing material on the pavement when the Contractor begins his work, with the exception of oil-based paint. Existing oil-based striping shall be repainted using water-based paint per Caltrans Standard Specifications Section 84.

Unless approved otherwise by the Traffic Engineer, all repainted pavement markings shall be thermoplastic as described in Section 2.5 above.

3. CONCRETE WORK:

3.1 SIDEWALKS, CURB AND GUTTER, AND TRAFFIC SIGNAL POLE FOUNDATIONS

Portland Cement Concrete used for sidewalks, curb and gutter and traffic signal pole foundations shall meet the specifications for concrete class, minimum compressive strength, cement weight, combined aggregate gradation and maximum slump as indicated in the 1992 State of California's (Caltrans) Standard Specification.

Sidewalk and curb and gutter concrete mixtures shall include 1 pint of Lamp Black color admixture per 1 cubic yard of concrete.